Mr. Bracken
AP Chemistry

Name _____
Period _____

Ksp Problems Worksheet #4

Review over all types of Ksp Problems

1. Write the equilibrium expression for the solubility product constant (Ksp) for AgBr.

2. What is the molar solubility (maximum molarity) of Ag^+ in a saturated solution of AgBr?

3. What is the molar solubility of AgBr in a 0.015 M KBr solution?

4. <u>Would a precipitate be observed if the following were mixed</u>?
   100.0 mL of 0.00015 M $AgNO_3$ and 20.0 mL of 0.00050 M NaBr

5. A person adds solid $AgNO_3$ crystals into a large beaker containing a mixture of 0.0022 M KCl and 0.00011M KBr until a precipitate begins to form. Was the observed precipitate AgCl or AgBr?

6. What is the molar solubility of $CaSO_4$ in pure water at 25ºC?

7. What is the molar solubility of CaF_2 in pure water at 25ºC?

8. At 10°C, 8.9×10^{-5} g of $AgCl_{(s)}$ will dissolve in 100. mL of water. *Cannot use our pink sheet since its values are based on a temperature of 25°C.*

   (i) Write the equation for the dissociation of $AgCl_{(s)}$ in water.

   (ii) Calculate the maximum molarity of $AgCl_{(s)}$ in water at 10°C.

   (iii) Calculate the value of the solubility-product constant, K_{sp} for $AgCl_{(s)}$ at 10°C.

9. Answer the following questions that relate to the solubility of salts of lead and barium.

(a) A saturated solution is prepared by adding excess $PbI_{2(s)}$ to distilled water to form 1.0 L of solution at 25°C. The concentration of $Pb^{2+}{}_{(aq)}$ in the saturated solution is 0.0013 M. The chemical equation for the dissolution of $PbI_{2(s)}$ in water is shown below.

$$PbI_{2(s)} \leftrightarrows Pb^{2+}{}_{(aq)} + 2\,I^{-}{}_{(aq)}$$

(i) Write the equilibrium-constant expression for the equation.

(ii) Calculate the molar concentration of $I^{-}{}_{(aq)}$ in the solution.

(iii) Calculate the value of the equilibrium constant, K_{sp}.

(b) A saturated solution is prepared by adding $PbI_{2(s)}$ to distilled water to form 2.0 L of solution at 25°C. What are the molar concentrations of $Pb^{2+}{}_{(aq)}$ and $I^{-}{}_{(aq)}$ in the solution? Justify your answer.

(c) Solid NaI is added to a saturated solution of PbI_2 at 25°C. Assuming that the volume of the solution does not change, does the molar concentration of $Pb^{2+}{}_{(aq)}$ in the solution increase, decrease, or remain the same? Justify your answer.

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(d) When a 500. mL sample of 8.2×10^{-6} *M* $Ba(NO_3)_2$ is added to 500. mL of 8.2×10^{-6} *M* Na_2CrO_4, no precipitate is observed. The value of K_{sp} for the salt $BaCrO_4$ is 1.2×10^{-10}.

(i) Calculate the molar concentrations of $Ba^{2+}_{(aq)}$ and $CrO_4^{2-}{}_{(aq)}$ in the combined 1.00 L of solution.

(ii) Use the molar concentrations of $Ba^{2+}_{(aq)}$ ions and $CrO_4^{2-}{}_{(aq)}$ ions as determined above to show why a precipitate does not form. You must include a calculation as part of your answer.